CLAIMS:

1. An optical scanning device for scanning optical record carriers with radiation of a selected wavelength, the device including an objective lens, having an axial direction and a radial direction, and a phase structure which is non-periodic with respect to the radial direction, the non-periodic phase structure being arranged to compensate for comatic aberrations generated in the objective lens when an optical record carrier is read in a direction which is non-axial with respect to said objective lens, whereby an improved field of view is provided for said objective lens.

2. An optical scanning device according to claim 1, wherein said non-periodic phase structure compensates at least 50% of the root mean square (rms) comatic wavefront error at a certain field angle with respect to the axial direction and caused by the objective.

3. An optical scanning device according to claim 2, wherein said non-periodic phase structure compensates at least 70% of the root mean square (rms) comatic wavefront error at a certain field angle with respect to the axial direction and caused by the objective.

4. An optical scanning device according to any of claims 1 to 3, wherein the rms wavefront error caused by the comatic aberration generated by the objective lens at a maximum required field angle with respect to the axial direction, as compensated by the non-periodic phase structure, is less than 40mλ.

5. An optical scanning device according to claim 4, wherein the rms wavefront error caused by the comatic aberration generated by the objective lens at a maximum required field angle with respect to the axial direction, as compensated by the non-periodic phase structure, is less than 20mλ.

6. An optical scanning device according to any preceding claim, wherein said non-periodic phase structure includes a plurality of annular zones, each of said zones

comprising a step of a substantially constant height with respect to a rotationally symmetrical aspheric shape generally followed by said objective lens.

7. An optical scanning device according to claim 6, wherein steps in said non-periodic phase structure generate a relative phase difference of approximately a multiple of 2π for radiation of said selected wavelength when an optical record carrier is read in said axial direction.

8. An optical scanning device according to claim 6 or 7, wherein the radial widths of said zones are selected in dependence on the comatic aberration to be compensated for.

9. An optical scanning device according to claim 8, wherein said zones comprise a zone (a) with a nonzero height, measured in relation to said aspheric shape, located in the region in which the normalized pupil coordinate ρ ranges from 0.45 to 0.84.

10. An optical scanning device according to claim 9, wherein said zone (a) ends prior to a normalized pupil coordinate ρ of 0.85.

11. An optical scanning device according to claim 8, 9 or 10, wherein said zones comprise a zone (b) with a nonzero height, measured in relation to said aspheric shape, located in the region in which the normalized pupil coordinate ρ ranges from 0.9 to 1.00.

12. An optical scanning device according to claim 11, wherein said zones comprise a plurality of zones with a nonzero height, measured in relation to said aspheric shape, located in the region in which the normalized pupil coordinate ρ ranges from 0.9 to 1.00.

13. An optical scanning device according to any of claims 6 to 12, wherein the heights of said zones are selected substantially optimally in relation to the comatic aberration to be compensated for.

14. An optical scanning device according to any of claims 6 to 13, wherein the number of said zones is greater than four.

15. An optical scanning device according to any of claims 6 to 13, wherein the number of said zones is less than ten.

16. An optical scanning device according to any preceding claim, wherein said non-periodic phase structure is formed on the surface of said objective lens.

17. An optical system including an optical element having optical power and an axial direction and a radial direction, and a phase structure which is non-periodic with respect to the radial direction, the non-periodic phase structure being arranged to compensate for comatic aberrations generated by the optical element when an optical beam traverses the optical system in a direction which is non-axial with respect to said element, whereby an improved field of view is provided for said optical element.